V. *On the water of the Mediterranean.* *By* WILLIAM HYDE WOLLASTON, *M.D. F.R.S.*

Read December 18, 1828.

THE object of the present communication is to do justice to the memory of my late friend, Dr. MARCET, by recording the result of one of his latest efforts in the cause of science.

In his examination of sea-water, of which he gave an account in the Philosophical Transactions for 1819, the specimens with which he had been supplied from different depths in the Mediterranean, had not been sufficient to show what becomes of the vast amount of salt brought into that sea by the constant current which sets eastward through the Straits of Gibraltar. For though the escape of the water of that current may be fully accounted for by its evaporation, which must be very rapid and copious on the sunny shallows of Africa, yet the salt which that water held in solution, must remain in the basin of the Mediterranean, or escape by some hitherto unexplained means of exit.

In the hope of obtaining a more abundant supply of water from the greatest accessible depths, especially near the Straits, he begged assistance from Captain WILLIAM HENRY SMITH, R.N. who was engaged to make a survey of certain parts of that sea, and supplied that officer with the apparatus for raising water from great depths, which was contrived by Mr. TENNANT, and is described in the communication already referred to.

The zeal with which Dr. MARCET himself prosecuted his inquiries was so well known, that others were always willing to second his efforts, from a confidence that their labour would not be unprofitably wasted; and Captain SMITH did not fail to take every opportunity of collecting specimens in the course of his survey. But when he heard that Dr. MARCET was no more, not being aware of the interest with which the specimens would be received and examined by many surviving friends, he was unfortunately but too ready to oblige

other persons with portions of his collection, which were afterwards applied by them to other objects.

Nevertheless, at the time when I had the good fortune to be introduced to Captain SMITH, in the month of June 1827, he still retained in his possession three bottles, the remainder of his stock, and at my request most obligingly sent them to me for examination.

Happily, one of these is such as to accord in the most complete manner with the anticipation, that an accumulation of denser water might be found at great depths in the neighbourhood of the Straits, from which a counter-current beneath, though far less rapid, might carry westward into the Atlantic, as much salt as enters, with the eastward current near the surface, from that ocean into the Mediterranean.

The evidence of this will be comprised, indeed, in very few words: for though the two first specimens, taken at distances of about 680 and 450 miles from the Straits, and at depths of 450 and 400 fathoms respectively, do not exceed in density that of many ordinary samples of sea-water, yet the last, which was taken up at about 50 miles within the Straits, and from a depth of 670 fathoms, has a density exceeding that of distilled water by more than four times the usual excess, and accordingly leaves upon evaporation more than four times the usual quantity of saline residuum.

Hence it is clear, that an under-current outward of such denser water, if of equal breadth and depth with the current inward near the surface, would carry out as much salt below as is brought in above, although it moved with less than $\frac{1}{4}$th part of the velocity, and would thus prevent a perpetual increase of saltness in the Mediterranean Sea beyond that existing in the Atlantic.

On comparison of the relative specific gravities and quantities of salt, in the Table subjoined to this paper, with those in Dr. MARCET's Table, there may be remarked a want of accordance between the two experimenters, that will require to be explained.

This difference arises from the different temperatures at which his results and mine were dried. In his experiments the degree of heat chosen was 212°; in mine, the temperature was raised beyond 300°. In each case it will be seen that the quantity of saline contents to be obtained may be estimated from the specific gravity, by multiplying the excess of density above that of distilled

water by a certain factor, which will vary with the temperature that we may select for drying.

At 212° this factor is about .144, and the product will then represent the saline contents + a quantity of water retained by the deliquescent salts. At 300°, and upwards, the factor is only .134, on account of a nearer approach to perfect desiccation.

But as the leading question considered in this paper does not turn upon the estimate or actual weighing of any small differences in quantity, I have not thought it necessary to spend much time in endeavouring to obtain as precise a determination as resulted from the more careful manipulation of Dr. MARCET himself.

TABLE.

	Latitude.	Longitude.	Depth.	Sp. Gravity.	Salt per Cent.
	° ′	° ′			
No. 1	38 30	4 30 E.	450 fath.	1.0294	4.05
2	37 30	1 0 E.	400	1.0295	3.99
3	36 0	4 40 W.	670	1.1288	17.3
Gibraltar	36 7	5 22 W.			